

FI502 Industrial Instrumentation

Module name:	Industrial Instrumentation	
Module level, if applicable:	Undergraduate	
Code:	FI502	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6 th	
Module coordinator:	Ahmad Aminudin	
Lecturer(s):	Ahmad Aminudin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective Courses	
Type of Teaching	Contact hours per week during the semester	Class Size
<ol style="list-style-type: none"> 1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (Practical/project) 	1 hour 40 minutes	25
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11 hour 54 minutes/714 minutes for two exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Digital Electronics, Algorithms and Programming, Metrology and Calibration	
Course Learning Outcomes (CLO):	<p>After taking this course the students have ability to:</p> <p>CLO1. Describe the knowledge about manufacturing/Industry</p> <p>CLO2. Describe the knowledge of actuator systems and mechanical systems in industry</p> <p>CLO3. Analyse the working principles of pneumatic and hydraulic systems in their application in industry</p> <p>CLO4. Describe the knowledge of PLC architecture</p> <p>CLO5. Create and analyse basic programming, timers, counters, arithmetic, master control and sequential PLC</p>	

	<p>CLO6. Describe the knowledge of Robot Control with PLC and PLC Networks</p> <p>CLO7. Analyse related installation, troubleshooting and maintenance of PLC</p>																																				
Content:	<p>In this course, students will study (i) an explanation of the Industrial Instrumentation course, Introduction to Manufacturing / Industry, (ii) Actuators and Mechanics: Electromechanical actuators, fluid actuators, actuators based on active materials, bearings, pulleys, belt chain, cam and follower; (iii) Pneumatic and hydraulic elements: Compressor, Piston type and operation, Valve type, regulator, filter; (iv) Pneumatic and hydraulic applications in industry; (v) PLC architecture: CPU, Input module, output module, Memory, Power Supply; (vi) Basic Programming: Ladder Diagrams; (vii) Timer Instructions: Basic functions of PLC timer, Timer Type and timer programming; (viii) Counter Instructions: Basic functions of PLC Counter, Counter Programming and Combined Timer-counter programming; (ix) PLC Arithmetic Instructions: Addition, subtraction, multiplication and division; (x) Skip Instructions and control master: SKIP Instructions, MC Instructions, Jump Instructions; (xi) Sequential instructions: Sequential functions, Sequential time format, sequential programming; (xii) Robot Control with PLC: Two-axis robot basics, robot sequential programming and industrial robot control; (xiii) PLC network: Industrial control network tier, PLC network communication, DCS; (xiv) PLC installation, troubleshooting and maintenance: checking, assembly, grounding, testing, wiring, protection, troubleshooting and maintenance procedures.</p>																																				
Study/exam achievements:	<p>The final mark will be weight as follow:</p> <table border="1"> <thead> <tr> <th>No</th> <th>CLO</th> <th>Assessment Object</th> <th>Assessment Techniques</th> <th>Weight</th> </tr> </thead> <tbody> <tr> <td rowspan="3">1</td> <td rowspan="3">1 – 7</td> <td>Subject specific competences:</td> <td rowspan="3">Written</td> <td rowspan="3">20 %</td> </tr> <tr> <td>a. Assignments</td> </tr> <tr> <td>b. Exam</td> </tr> <tr> <td rowspan="2">1 – 4</td> <td rowspan="2">4 – 7</td> <td>- Mid exam</td> <td>Written test</td> <td>25%</td> </tr> <tr> <td>- Final exam</td> <td>Written test</td> <td>25%</td> </tr> <tr> <td rowspan="2">2</td> <td rowspan="2">5 & 7</td> <td>Subject specific competences:</td> <td rowspan="2">Performance</td> <td rowspan="2">10%</td> </tr> <tr> <td>- Class Activity</td> </tr> <tr> <td></td> <td></td> <td>- Project</td> <td>Performance</td> <td>20%</td> </tr> <tr> <td colspan="4" style="text-align: center;">Total</td> <td>100%</td> </tr> </tbody> </table>	No	CLO	Assessment Object	Assessment Techniques	Weight	1	1 – 7	Subject specific competences:	Written	20 %	a. Assignments	b. Exam	1 – 4	4 – 7	- Mid exam	Written test	25%	- Final exam	Written test	25%	2	5 & 7	Subject specific competences:	Performance	10%	- Class Activity			- Project	Performance	20%	Total				100%
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		- Project	Performance	20%																																	
Total				100%																																	
Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS																																				
Literature:	<ol style="list-style-type: none"> 1. Paul, B. (2014). <i>Industrial Electronics and Control Including Programmable Logic Controller Third Edition</i>. PHI Learning Private Limited, Delhi. 2. Bolton, W. (2015). <i>Programmable Logic Controllers Sixth edition</i>. Elsevier Ltd. 3. Ridley, J. (2004). <i>Mitsubishi FX Programmable Logic Controllers Applications and Programming</i>. Elsevier. 																																				

	4. Webster, J. G., & Eren, H. (2017). <i>Measurement, instrumentation, and sensors handbook: Electromagnetic, optical, radiation, chemical, and biomedical measurement</i> . CRC Press.
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PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2			√									
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								
CLO7					√							